5. A company bakes computer chips in two ovens, oven A and oven B. The chips are randomly assigned to an oven and hundreds of chips are baked each hour. The percentage of defective chips coming from these ovens for each hour of production throughout a day is shown below.

Percentage of Defective Chips

Hour	Oven A	Oven B
1	45	36
2	32	37
3	34	33
4	31	34
5	35	33
6	37	32
7	31	33
8	30	30
9	27	24

The percentage of defective chips produced each hour by oven A has a mean of 33.56 and a standard deviation of 5.20. The percentage of defective chips produced each hour by oven B has a mean of 32.44 and a standard deviation of 3.78. The hourly differences in percentages for oven A minus oven B have a mean of 1.11 and a standard deviation of 4.28.

Does there appear to be a difference between oven A and oven B with respect to the mean percentages of defective chips produced? Give appropriate statistical evidence to support your answer.

Paired t-test

$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

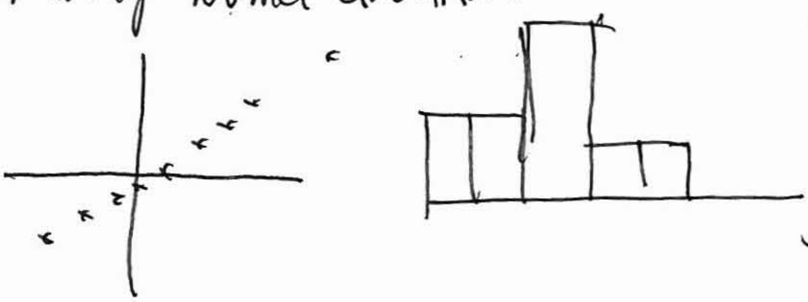
To conduct a Paired t-test, I will need to meet the Independence Assumption, the Paired Data Assumption, and the Nearly Normal Condition. To meet the Independence Assumption, I will satisfy the

Randomization Condition: The chips are a random sample of all chips & also they are assigned to the ovens randomly

10% Condition: We can assume that the number of chips represent less than 10% of the chips the company manufactures

To satisfy the Paired-Data Assumption I will look at the situation & I can assume they are blocked based on the hour they are produced.

To satisfy the Normal Population Assumption, I will satisfy the Nearly Normal Condition:



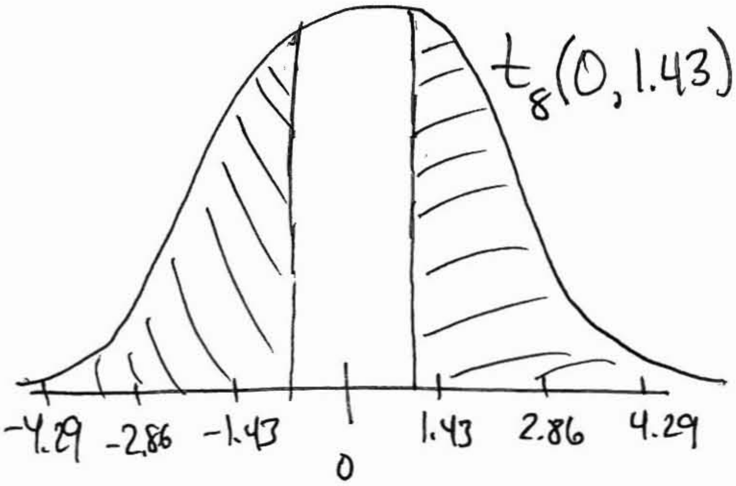
Given the two plots, the distribution of the differences in the sample appear to be unimodal (see histogram) and symmetric (see normal probability plot)

Since I have satisfied the Assumptions/Conditions I can use a t-distribution with 8 degrees of freedom to model the sampling distribution for the mean differences. I will use that t-distribution to conduct a Paired t-test

$\bar{d} = 1.11$

$S_{\bar{d}} = 4.28$

$$SE(\bar{d}) = \frac{S_{\bar{d}}}{\sqrt{n}} = \frac{4.28}{\sqrt{9}} = 1.43$$



$$t_8 = \frac{\bar{d} - \mu_d}{SE(\bar{d})} = \frac{1.11 - 0}{1.43} = .778$$

$$\text{P-value} = 2p(\bar{d} > 1.11)$$
$$= 2p(t_8 > .778$$
$$= .46$$

A P-value of .46 indicates that the probability of getting the result (or a more extreme result) will happen in approximately 46 out of every 100 samples, given that the null is true. This high probability is not enough evidence to reject the null, and as a result, I FAIL TO REJECT THE NULL. Our results are not statistically significant. There does not appear to be any difference in the ovens w/respect to the mean percentages of ~~defected~~ defective chips produced.